SIF 3.0 Framework (.NET)

Version 1.1.0

Training Exercises (US)

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Table of Contents

1. Introduction 4

2. Exercise 1: SIF 3 Framework Installation & Verification 4

2.1. Download the SIF 3 Framework 4

2.2. Load the SIF 3 Framework into Visual Studio 4

2.3. Create an Environment 5

2.4. Start the Environment Provider 5

2.5. Start the demo student Provider 5

2.6. Run the demo student Consumer 6

2.7. Review expected behaviour 6

3. Exercise 2: Student Consumer 6

3.1. Consumer pre-requisites and configuration 6

3.1.1. log4net 6

3.1.2. AutoMapper 6

3.1.3. SIF 3 Framework libraries 7

3.1.4. SIF 3 Framework configuration 7

3.2. Define the student data model 7

3.3. Implement the student Consumer 7

3.4. Implement a console application 7

3.5. Test the student Consumer 8

3.6. Advanced exercise 8

4. Exercise 3: School Provider 8

4.1. Provider pre-requisites and configuration 8

4.1.1. NHibernate 8

4.1.2. SQLite 8

4.1.3. AutoMapper 8

4.1.4. SIF 3 Framework libraries 9

4.1.5. Web API specific configuration 9

4.2. Define the school data model 9

4.3. Implement the school service interface 9

4.4. Implement the school Provider 10

4.5. Create a new Environment for the school Provider 10

4.6. Start the school Provider 10

4.7. Test the school Provider 10

4.7.1. Postman (Chrome Plugin) 10

4.7.2. Implement a school Consumer (optional) 11

4.8. Advanced Exercise 12

5. Exercise 4: Service Paths 12

5.1. Pre-requisites and configuration 12

5.2. Provider implementation 12

5.3. Consumer implementation 12

6. Important notes 13

6.1. Issues with the Environment Provider 13

# Introduction

Before attempting the exercises in this document, it is assumed that the following documents have already been read:

* Sif3Framework .NET Developer’s Guide
* Sif3Framework .NET Demo Usage Guide

The exercises presented here run the demo projects included with the SIF 3 Framework, and copy heavily from the information presented in the above documents.

# Exercise 1: SIF 3 Framework Installation & Verification

**Task:**

* Download the SIF 3 Framework
* Load the SIF 3 Framework into Visual Studio
* Create an Environment
* Start the Environment Provider
* Start the demo student Provider
* Run the demo student Consumer

## Download the SIF 3 Framework

The SIF 3 Framework can be downloaded from GitHub. To do so, use the following link and click on the “Download ZIP” button.

<https://github.com/nsip/Sif3Framework-dotNet>

Once downloaded, extract to an appropriate directory.

## Load the SIF 3 Framework into Visual Studio

The Visual Studio Solutions for this framework can be found under the Code directory. For the demo projects to be run, the Sif3Framework and Sif3FrameworkDemo Solutions need to be loaded into Visual Studio and built. If loaded for the first time, Visual Studio may require time to retrieve associated third party libraries that have been referenced via NuGet.

Once opened in Visual Studio, no additional configuration should be required to run the demo projects. This framework has been maintained using Visual Studio 2015, but should load in the Express version.

## Create an Environment

Before a Service Consumer and Object Service Provider can interact, an Environment must be created to manage the session information between them. Once an Environment has been defined, then the Service Consumer and Object Service Provider are able to register to that Environment. This registration is managed by an Environment Provider.

Environment definition generally falls under the domain of a SIF Administrator. However, creation of an initial Environment for this demo is performed by running the *Scripts\BAT\Demo execution\DemoUsSetup.bat* script. This script uses the Sif.Framework.Demo.Setup project to create and populate a demo database with an initial Environment definition. An SQLite database is used so that no configuration changes are required to be able to run this demo out of the box.

NOTE: Before running the scripts mentioned above, the Sif3Framework.sln Solution needs to be loaded into Visual Studio first for the Sif.Framework.Demo.Setup project to be built.

All mandatory data associated with the applications (e.g. applicationKey, sharedSecret) has been predefined for these demos.

## Start the Environment Provider

Open the Sif3Framework Solution in Visual Studio and simply run it (by clicking on the Internet Explorer button shown below).

Internet Explorer button

If the Internet Explorer button is not visible, it will be necessary to make the Sif.Framework.EnvironmentProvider project of the Solution the single start-up project.

The Sif.Framework.EnvironmentProvider project has been configured to run in IIS Express on a particular port (as specified in the Visual Studio Project properties). This port is referenced in the Environment configured from the previous section.

For the moment, ignore the “HTTP Error 403.14 – Forbidden” message that appears in the popped up Internet Explorer window on start-up. As this is a Web API service, the fact that it does not have a home page is not relevant for this demo.

## Start the demo student Provider

Load the Sif3FrameworkDemo Solution into Visual Studio, set the single start-up project to Sif.Framework.Demo.Us.Provider and simply run it (by clicking on the Internet Explorer button shown below).

Internet Explorer button

By default, the Sif.Framework.Demo.Au.Provider has been configured as the start-up project and therefore needs to be changed to use the SIF US data model.

As with the Sif.Framework.EnvironmentProvider, the Sif.Framework.Demo.Us.Provider project has been configured to run in IIS on a particular port.

## Run the demo student Consumer

Once the Environment Provider and student Provider have been successfully started, run the *Scripts\BAT\Demo execution\DemoUsConsumer.bat* script to start the student Consumer. This script runs the Sif.Framework.Demo.Us.Consumer Project of the Sif3FrameworkDemo Solution.

## Review expected behaviour

The scenario illustrated in this demo is one where a Consumer is making a call for student data in a Direct Environment. As such, once this data has been consumed, the demo has been completed.

In this case, the student Consumer simply prints student details to the console based upon the CRUD operations executed. Once the details have been printed, the Environment Provider and student Provider instances can be stopped.

# Exercise 2: Student Consumer

**Task:**

* Implement a student Consumer from scratch

## Consumer pre-requisites and configuration

Even though the demo projects that come with the SIF 3 Framework already include a student Consumer, it is useful to implement your own to understand the third party libraries and configuration required for implementing a Consumer from scratch. To this end, in Visual Studio create a new Solution and new Console Application Project.

### log4net

Using “Manage NuGet Packages…”, add the log4net package to this project. Instructions on the use of log4net fall outside the scope of this document. However, the following paragraphs summarise log4net configuration required for log output.

Add the following line of code to the end of the AssemblyInfo.cs class.

[assembly: log4net.Config.XmlConfigurator(Watch = true)]

Add appropriate log4net Appenders and Loggers to App.config. For those new to log4net, it would be simpler if the App.config file from the demo Consumer project is copied.

### AutoMapper

Under normal circumstances, the AutoMapper package would be added in the same manner as the log4net installation. However, due to an issue encountered when using the current release of AutoMapper (3.2.1), the version used in this framework is AutoMapper 3.1.1. To add this version of AutoMapper to new projects, within Visual Studio select the Consumer project and run the following command in the Package Manager Console.

PM> Install-Package AutoMapper -Version 3.1.1

### SIF 3 Framework libraries

Add the following libraries from the SharedLibs directory included with this Framework:

* Sif.Framework 1.1.0\Sif.Framework.dll
* Sif.Specification.Infrastructure 3.0.1\Sif.Specification.Infrastructure.dll
* Sif.Specification.DataModel.Us 3.3\Sif.Specification.DataModel.Us.dll

### SIF 3 Framework configuration

For a Consumer to run, certain configuration settings are required. These settings identify the Consumer to the Environment Provider. The easiest way to define these settings is to copy the SifFramework.config file from the demo Consumer project.

For these exercises, leave the settings as they are since they already correspond to the Environment information stored in the demo database (used by the Environment Provider). For more information on these configuration settings, refer to the “Sif3Framework .NET Demo Usage Guide” document.

## Define the student data model

For implementing a Consumer, a SIF data object needs to be specified. In this case, create a student data model based upon the SIF US xStudentType type. A requirement for the use of this Framework is that the model object used has to implement the IDataModel interface. For an example implementation, refer to the Consumer demo project.

Create a new class (e.g. XStudent.cs) and implement the IDataModel interface (where the RefId property equates to the refId of xStudentType).

It is important that the model object used will serialise (XML) to meet the US 3.3 Data Model Specification. To assist with this requirement, the Sif.Specification.DataModel.Us.v3\_3 Project can be used as a reference for any data model objects used.

## Implement the student Consumer

To implement the Consumer, create a new class (e.g. XStudentConsumer.cs) that extends the BasicConsumer class with the previously defined data model class (e.g. XStudent.cs) as the generic type. Implement the constructors to simply call upon the “base” constructors of the BasicConsumer class.

## Implement a console application

Create a class with a Main() method that will be run the student Consumer. In the Main() method, instantiate the new Consumer class (e.g. XStudentConsumer.cs) by calling the constructor that takes multiple string parameters, and pass it a parameter of “Sif3UsDemoApp” (to match the Environment settings used by the existing demo Provider project).

Call the Register(), Query() and then Unregister() methods, writing the student details retrieved to the console.

## Test the student Consumer

To test the newly created student Consumer, repeat Exercise 1 replacing the demo Consumer with this Consumer.

## Advanced exercise

If you have successfully completed this exercise and have more time, why don’t you try to “Update” a student?

# Exercise 3: School Provider

**Task:**

* Implement a school Provider (or any other object of your choice)
* Test using Postman, or implement a school Consumer

## Provider pre-requisites and configuration

In Visual Studio, create a new Solution and new ASP.NET Web Application Project (an empty project set for Web API). For those new to Web API, refer to the following web page:

<http://www.asp.net/web-api/overview/getting-started-with-aspnet-web-api/tutorial-your-first-web-api>

### NHibernate

Using “Manage NuGet Packages…”, add the NHibernate package to this project. Instructions on the use of NHibernate fall outside the scope of this document.

Copy the SifFramework.cfg.xml NHibernate configuration file from the demo Provider project into this project. For the sake of this exercise, leave the SifFramework.cfg.xml unchanged to use the existing SQLite demo database (defined using relative paths).

### SQLite

Using “Manage NuGet Packages…”, add the SQLite package to this project. Instructions on the use of SQLite fall outside the scope of this document.

### AutoMapper

Under normal circumstances, the AutoMapper package would be added in the same manner as the NHibernate and SQLite installations. However, due to an issue encountered when using the current release of AutoMapper (3.2.1), the version used in this framework is AutoMapper 3.1.1. To add this version of AutoMapper to new projects, within Visual Studio select the Provider project and run the following command in the Package Manager Console.

PM> Install-Package AutoMapper -Version 3.1.1

### SIF 3 Framework libraries

Add the following libraries from the SharedLibs directory included with this Framework:

* Sif.Framework 1.1.0\Sif.Framework.dll
* Sif.Specification.Infrastructure 3.0.1\Sif.Specification.Infrastructure.dll
* Sif.Specification.DataModel.Us 3.3\Sif.Specification.DataModel.Us.dll

### Web API specific configuration

Due to the different methods the .NET Framework uses to XML serialise objects, the Global.asax.cs file that comes with the Project needs to be updated to specify a particular serialisation method. This is achieved by the following lines of code:

XmlMediaTypeFormatter formatter =

GlobalConfiguration.Configuration.Formatters.XmlFormatter;

formatter.UseXmlSerializer = true;

In addition, due to the default behaviour of the inherent XML serialiser used by Web API, the additional lines of code (below) are also required in the Global.asax.cs. Without these lines, the school Provider would return a list of school records with a root element of <ArrayOfxSchool> instead of the required <xSchools>.

XmlRootAttribute schoolsXmlRootAttribute = new XmlRootAttribute("xSchools") { Namespace = SettingsManager.ProviderSettings.DataModelNamespace, IsNullable = false };

ISerialiser<List<XSchool>> schoolsSerialiser = SerialiserFactory.GetXmlSerialiser<List<XSchool>>(schoolsXmlRootAttribute);

formatter.SetSerializer<List<XSchool>>((XmlSerializer) schoolsSerialiser);

## Define the school data model

For implementing a Provider, a SIF data object needs to be specified. In this case, create a school data model based upon the SIF US xSchoolType type. A requirement for the use of this Framework is that the model object used has to implement the IDataModel interface. For an example implementation, refer to the Provider demo project.

Create a new class (e.g. XSchool.cs) and implement the IDataModel interface (where the RefId property equates to the refId of xSchoolType).

It is important that the model object used will serialise (XML) to meet the US 3.3 Data Model Specification. To assist with this requirement, the Sif.Specification.DataModel.Us.v3\_3 Project can be used as a reference for any data model objects used.

## Implement the school service interface

Create a class (e.g. XSchoolService) that implements the IBasicProviderService interface with the previously defined data model class (e.g. XSchool.cs) as the generic type. For these exercises, it would be sufficient to only implement the Query() method.

## Implement the school Provider

To implement the Provider, create a new class (e.g. XSchoolsProvider.cs) that extends the BasicProvider class with the previously defined data model class (e.g. XSchool.cs) as the generic type. In the default constructor, call upon the “base” constructor of the BasicProvider class that accepts a service interface (in this case, the newly created XSchoolService).

As the Web API specification relies heavily on coding convention, a very important point to take into account when implementing a Provider:

1. The prefix to “Provider” defines both the SIF data model used and the Web Service URL, and MUST therefore be named XSchoolsProvider (not XSchoolProvider).

## Create a new Environment for the school Provider

Open the Project properties of this school Provider and copy the Project Url from the Web section.

Edit the *Data files\US\EnvironmentResponse.xml* file of the Sif.Framework.Demo.Setup Project and replace the *requestsConnector* URL with the URL of the new school Provider (keeping /api). Re-run the *Scripts\BAT\Demo execution\DemoUsSetup.bat* script.

## Start the school Provider

To test the newly created school Provider, repeat Exercise 1 replacing the demo Provider with this Provider (ignoring the running of a Consumer).

## Test the school Provider

### Postman (Chrome Plugin)

To test the school Provider without an actual Consumer, a REST Client is required. For these exercises, the Postman plugin for Chrome will be used (<https://chrome.google.com/webstore/detail/postman-rest-client/fdmmgilgnpjigdojojpjoooidkmcomcm?hl=en>). The following steps need to be performed:

* Create an Environment
* Retrieve all Schools

#### Create an Environment

Use Basic Auth with a Username of “Sif3UsDemoApp” and a Password of “SecretDem0”. These authentication settings have been pre-defined in the demo database using the Sif.Framework.Demo.Setup project (refer to the *Data files\US* XML files).

Use a URL of <http://localhost:62921/api/environments/environment>.

Use the POST HTTP operation.

Provide the following payload with the HTTP request (as pre-defined in the Sif.Framework.Demo.Setup project).

<?xml version="1.0"?>

<environment xmlns="http://www.sifassociation.org/infrastructure/3.0.1">

<solutionId>Sif3UsDemoSolution</solutionId>

<authenticationMethod>Basic</authenticationMethod>

<instanceId></instanceId>

<userToken></userToken>

<consumerName>Sif3UsDemoXStudentConsumer</consumerName>

<applicationInfo>

<applicationKey>Sif3UsDemoApp</applicationKey>

<supportedInfrastructureVersion>3.0.1</supportedInfrastructureVersion>

<dataModelNamespace><http://www.sifassociation.org/datamodel/na/3.3>

</dataModelNamespace>

<transport>REST</transport>

</applicationInfo>

</environment>

Specify the following headers:

* Authorization - Basic U2lmM1VzRGVtb0FwcDpTZWNyZXREZW0w
* Content-Type – application/xml
* Accept – application/xml

The Authorization header specified above is generated from Basic Auth with the provided Username and Password from above.

Once ready, send the POST request and save a copy of the response payload (which should match the *Data files\US\EnvironmentResponse.xml* file).

#### Retrieve all schools

From the response payload of the Environment POST operation (above), store the <sessionToken> value and the requestsConnector URL.

Using Basic Auth, set the Username to this <sessionToken> value and a Password of “SecretDem0”.

For the URL, use that returned as the requestsConnector URL, e.g. [http://localhost:<port>/api/XSchools](http://localhost:%3cport%3e/api/XSchools).

Use the GET HTTP operation.

Specify the following headers:

* Authorization – as generated from Basic Auth with the provided Username and Password from above
* Content-Type – application/xml
* Accept – application/xml

Once ready, send the GET request. The response payload should contain a list of schools.

### Implement a school Consumer (optional)

Implement a school Consumer as per the student Consumer created in Exercise 2 and run against the newly created school Provider.

## Advanced Exercise

If you have finished the above exercise successfully and have more time, implement remaining methods in the school Provider class.

# Exercise 4: Service Paths

**Task:**

* Implement a Service Path endpoint in the student Provider
* Use the student Consumer to query the Service Path

## Pre-requisites and configuration

Use the student Consumer created in exercise 2.

Repeat the steps in exercise 3 to implement a student Provider. In addition, follow the instructions outlined in the “Enabling Service Paths.docx” document to configure the Provider project appropriately. For a short cut, simply use the student Provider included with the demo project.

## Provider implementation

To create a Service Path endpoint, implement the Retrieve(IEnumerable<EqualCondition>, uint?, uint?, string, string) method of the IBasicProviderService interface for the student service that is passed to the student Provider.

When evaluating the EqualCondition, note that the Left property refers to the SIF data model and the Right property refers to a RefId. To implement a Service Path of the form …/xSchools/{}/xStudents, the Left property of the EqualCondition would be “xSchools” (not xSchool), and the Right property would be the RefId of the queried school. Based on the Conditions passed, return a list of matching students (in this case, all students for the specified school).

To simplify your implementation, simply output the Conditions to the console to ensure that your Service Path endpoint is being hit with the correct values.

## Consumer implementation

The previous exercise should be completed before this to ensure that there is an appropriate Service Path endpoint to query against.

To query the Service Path endpoint of the student Provider, call the QueryByServicePath(IList<EqualCondition>) method of the student Consumer . To query a Service Path of the form …/xSchools/{}/xStudents, create an instance of EqualCondition whereby the value of the Left property is “xSchools” (not xSchools and not xSchool) and the value of the Right property is the RefId of the queried school. Based on the Conditions passed, the call should return all students for the specified school.

# Important notes

## Issues with the Environment Provider

There is an existing issue with the Environment Provider whereby if an error occurs with data consumption or provision, an entry in the demo database is not being properly removed. As a workaround, should an exception occur during these exercises, it is highly recommended that the demo database be re-created before starting the Provider or running the Consumer. This can be performed by executing the *Scripts\BAT\Demo execution\DemoUsSetup.bat* script.